1947

" Welcome Shelter Near Trail's End "

FEDERAL-STATE COOPERATIVE SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for

MONTANA

MAY 1, 1947

by

Montana Agricultural Experiment Station
and
Division of Irrigation, Soil Conservation Service
United States Department of Agriculture

in cooperation with

U. S. Forest Service
U. S. Geological Survey
U. S. National Park Service
State Engineer of Montana

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Missouri Main Stem
Yellowstone
Bitterroot, Blackfoot and Clarks Fork
Flathead

FEDERAL-STATE COOPERATIVE

SNOW SURVEYS AND IRRIGATION WATER FORECASTS

FOR

MONTANA

Report Prepared

by

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Division of Irrigation
Soil Conservation Service
State Engineer of Montana
and
Montana State Agricultural Experiment Station
Bozeman, Montana

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
BASE MAP, MONTANA, 7-L-10
CANADA
IDAHO
WYOMING
NORTH DAKOTA
LINCOLN
FLATHEAD
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
RICHLAND
McCONE
DAWSON
PRAIRIE
WIBAUX
FALLON
CARTER
POWDER RIVER
CUSTER
ROSEBUD
TREASURE
YELLOWSTONE
BIG HORN
CARBON
STILLWATER
SWEET GRASS
PARK
GALLATIN
MADISON
BEAVERHEAD
JEFFERSON
BROADWATER
SILVER BOW
DEER LODGE
GRANITE
RAVALLI
MISSOULA
MINERAL
SANDERS
LAKE
PONDERA
TETON
CHOUTEAU
CASCADE
JUDITH BASIN
FERGUS
PETROLEUM
GARFIELD
MUSSELSHELL
GOLDEN VALLEY
WHEATLAND
MEAGHER
HELENA
POWELL
LEWIS AND CLARK
Milk River
Flathead R.
Flathead L.
Tobacco R.
Marias R.
Clark Fork
Bitterroot R.
Jefferson River
Yellowstone
Musselshell
Missouri
Little Missouri River
FORT PECK RESERVOIR
RES.
MARCH 1947
20 0 20 40 60 80
SCALE IN MILES
0 to 50 per cent above average
More than 50 per cent above average
STATE of MONTANA

SUMMARY WATER SUPPLY OUTLOOK
as of May 1, 1947

The water content of the snow pack on the high water sheds of western Montana increased considerably during April and is much greater than the amount recorded on the same date in 1946, and is considerably above the average for the period of record.

This assures above normal runoff with high water approaching flood stages at many points.

Although precipitation during April at representative valley stations was below normal, this condition does not appear to have been reflected at higher elevations.

Soil moisture is reported as better than average and on the whole the moisture prospects are favorable.

Reservoir storage is above average. Fourteen reservoirs in the Missouri Basin having a combined usable capacity of 19,811,540 acre feet were reported 80% full on May 1 as compared to 70% full a year ago. The above normal snow pack assures a complete fill early in the season.

RUNOFF FORECASTS AT SELECTED POINTS FOR MONTANA STREAMS

Season - 1947

STREAM	GAGING STA.	FORECAST FOR 1947 SECOND FOOT DAYS MAY-JUNE	FORECAST FOR 1947 SECOND FOOT DAYS JUL-AUG-SEPT.	MEASURED RUNOFF FOR PREVIOUS YEARS SECOND FOOT DAYS MAY - JUNE 1946	1945	1944	JULY -AUG - SEPT. 1946	1945	1944	RELIABILITY OF FORECAST MAY	JULY-AUG-SEPT.
Missouri											
Hyalite	Ranger Sta.	12,180	6,212	8,125	10,241	11,107	5,466	7,168	6,582	Good	Fair
Gallatin	Gal. Gateway	169,318	81,617	133,880	112,145	127,767	63,880	81,715	69,624	Good	Fair
Madison	W. Yellowstone	49,486	37,685	Not Av.	44,680	41,866	Not Av.	38,988	36,698	Fair	Fair
Yellows.	Corwin Sprs.	349,098	380,455	494,480	416,890	387,620	269,680	457,590	301,480	Good	Fair
Yellows.	Billings	1,191,184	Normal	961,420	998,500	1,138,910	- -	977,450	800,930	Fair	Fair
Musselsh.	Delpine	1,970	1,100	Not.Av.	1,137	1,076	Not Av.	875	1,135	Fair	Fair
Columbia											
Nevada Cr.	Finn	8,600	1,860	- -	- -	3,415	- -	-	1,362	Fair	- -
Clark's Fk.	Heron	4,675,000	2,370,000	Not Av.	- -	1,588,800	- -	-	874,950	Fair	- -
Bitterroot	Darby	205,000	71,000	- - -	- -	110,286	- -	-	37,885	Fair	- -

NARRATIVE FORECASTS

Missouri Basin

Gallatin River - The water content at three locations on the Gallatin water shed was a great deal above that of a year ago and is approximately 40% greater than the average for the past 13 year period of record.

Madison River - At 13 locations on the Madison water shed the water content on May 1 was from 30 to 100% greater than for a corresponding date in 1946, and is 44% more than for the average 13 year period of record.

Jefferson River - The water content at one snow course was 46% above last year and 38% above the 11 year average.

Main Stem above Great Falls - At 5 locations on tributary streams throughout the Missouri River the water content on May 1 was a great deal higher than a year ago and was from 40% to 93% greater than the average for the period of record.

Sun River - No data available.

Marias River - The water content for Marias Pass was approximately 40% greater than last year and 60% above the 13 year average.

Mussellshell River - No measurements made May 1. Conditions are believed to be comparable to those on other water sheds in the Missouri Basin.

Yellowstone Basin

Snow surveys were made as of May 1 for the first time in the Yellowstone Basin. Therefore, comparisons with previous years are not possible; however, the water content shows a substantial increase during the month of April and the prospects are favorable for above normal runoff.

COLUMBIA DRAINAGE BASIN

Bitterroot River - Measurements at three snow courses on the Bitterroot water shed indicate a water content from 20% to 50% greater than 1946, and about 20% above the average for the period of record.

Blackfoot River - On the Blackfoot water shed two measurements show a water content a great deal higher than 1946 and more than 60% above the past 11 year period of record.

Clarks Fork above Milltown - On the water shed tributary Clarks Fork above Milltown, measurements at three locations show a water content approximately 50% above the 11 year average.

Clarks Fork below Milltown - On the water shed tributary on the Clarks Fork below Milltown measurements at 5 locations showed water content from 10% to 100% above 1946 and approximately 60% above the 11 year period of record.

Flathead River - On the Flathead water shed measurements were made on May 1 at 5 locations. All of these show a great increase over 1946 and represent an average of approximately 60% above that for the period of record.

Kootanai - Measurements at Barcee Mt. were about 4% above that of a year ago but was 45% above the average for the 11 year period of record.

STORAGE IN RESERVOIRS OF MONTANA

COLUMBIA RIVER BASIN — APRIL 30, 1947

DATA FURNISHED BY OPERATING ORGANIZATIONS

COMPILED BY WATER RESOURCES BRANCH, U.S. GEOLOGICAL SURVEY, HELENA, MONT.

Reservoir	Located on or diverting from	Usable Capacity Acre-feet	Contents this date Acre-feet	Contents a year ago Acre-feet
Irrigation Purposes				
[b] E Fk Rock Cr. Res.	E Fk Rock Cr.	16,040	No data	No Data
[b] Nevada Creek Res.	Nevada Cr. Res.	12,600	11,180	11,150
[b] W Fk Bitterroot Res.	W Fk. Bitterr.	31,700	22,000	No Data
[c] Como Lake	Rock Creek	34,800	No Data	+9,400
[d] Little Bitterroot L.	Lt. Bitterr. R.	18,000	No Data	2,850
[d] Hubbart Reservoir	Lt. Bitterroot	12,100	" "	2,560
[d] Upper Dry Fork Res.	Dry Fork Creek	2,700	" "	844
[d] Dry Fork Res.	Dry Fork Creek	4,000	" "	2,570
[d] Twin Res. Canals	(Mission Valley)	600	" "	380
[d] Pablo Res. Canals	(Mission Valley)	25,000	" "	13,930
[d] Lower Crow Res.Crow Cr.	(Mission Valley)	10,350	" "	10,220
[d] Kicking Horse Res.Canals	(Mission Valley	8,350	" "	2,500
[d] Ninepipe Res. Canals	(Mission Valley)	14,870	" "	12,250
[d] McDonald Res.Post Cr.	(Mission Valley)	8,225	" "	657
[d] Mission Res.	(Mission Valley)	7,250	" "	1,550
[d] Tabor Res. Dry Cr.	(Mission Valley)	23,300	" "	10,670
[d] Lower Jocko L.Jocko R.	(Mission Valley)	7,600	" "	1,250
Power Purposes				
[a] Georgetown Lake	Flint Cr.	31,000	22,270	23,160
[a] Flathead Lake (Somers)	Flathead R.	*1,791,000	1,137,000	1,156,000

Data furnished by:

a Montana Power Company
b Montana State Water Conservation Board
c Bitterroot River Irrigation District
d Office of Indian Affairs

* Contents at elev. 2893, considering 2878 as base. Contents at authorized min. elev. 2883, 572,300 acre-feet.

† FIRST DAY OF FOLLOWING MONTH.

STORAGE IN RESERVOIRS OF MONTANA

MISSOURI RIVER BASIN APRIL 30, 1947

DATA FURNISHED BY OPERATING ORGANIZATIONS

COMPILED BY WATER RESOURCES BRANCH, U.S. GEOLOGICAL SURVEY, HELENA, MONT.

Reservoir	Located on or diverting from	Usable Capacity Acre-feet	Contents this mo.	Contents year ago
Power Purpose				
[a] Lake Sewall	Missouri	37,800	35,470	36,600
[a] Hauser Lake	Missouri	52,090	39,730	42,870
[a] Holter Reservoir	Missouri	73,600	59,540	61,730
[a] Hebgen Reservoir	Madison R.	345,000	179,100	191,700
[a] Madison Res.	Madison R.	41,000	38,470	37,400
[a] Mystic Lake	W.Rosebud Cr.	20,800	3,280	9,610
Navigation & Power				
[b] Ft. Peck Res.	Missouri	19,000,000	15,225,020	13,270,000
[a] Lake Helena	Missouri R.	10,450	4,640	5,900
[c] Irrigation Purpose				
Cooney Res.	Red Lodge Cr.	27,500	13,440	8,320
[d] Gibson Res.	N.Fk.Sun R.	105,000	64,640	76,680
[d] Willow Creek	N.Fk.Sun & Wil.Cr.	32,300	16,940	11,620
[d] Pishkun Res.	N.Fk.Sun R.	32,000	17,230	22,390
[e] Lower Two Medicine L.	Two Med. R.	14,000	+9,800	9,200
[e] Four Horns Res.	Badger Cr.	20,000	11,800	5,800

Data furnished by:

a Montana Power Company
b U.S. Army Engineers
c Montana State Water Conservation Board
d Bureau of Reclamation
e Office of Indian Affairs

+ FIRST DAY OF FOLLOWING MONTH

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
STATE OF MONTANA, MONTHLY PRECIPITATION FOR
OCTOBER 1, 1946 - APRIL 30, 1947

STATIONS	1946 OCTOBER		1946 NOVEMBER		1946 DECEMBER		1947 JANUARY		1947 FEBRUARY		1947 MARCH		1947 APRIL	
	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.
WEST OF DIVIDE														
Butte	1.84	+1.05	1.19	+0.79	0.66	+0.22	0.65	+0.25	0.53	+0.11	0.77	+0.13	1.05	-0.01
Deer Lodge	2.17	+1.49	1.31	+0.76	2.41	+1.90	0.18	-0.41	0.35	-0.08	0.29	-0.32	0.67	-0.15
Hamilton	2.84	+1.93	2.19	+1.38	2.43	+1.72	0.44	-0.35	1.14	+0.39	0.36	-0.33	0.63	-0.24
Kalispell	3.18	+2.12	1.99	+0.64	1.82	+0.37	1.00	-0.57	0.90	-0.21	0.90	-0.05	0.65	-0.15
Missoula	2.33	+1.38	0.82	-0.08	1.43	+0.48	0.42	-0.43	1.05	+0.25	0.47	-0.35	0.38	-0.52
CENTRAL DIVISION														
Babb	4.61	+3.43	1.38	+0.39	0.89	-0.05	0.70	-0.24	0.77	-0.05			0.42	-1.24
Dillon	1.35	+0.41	0.75	-0.05	0.23	-0.51	0.12	-0.71	0.32	-0.40	0.49	-0.67	0.58	
Fort Benton	1.77	+1.05	0.63	+0.04	0.73	+0.27	0.25	-0.41	0.87	+0.38	0.90	+0.28	0.54	-0.58
Great Falls	1.53	+0.67	1.78	+1.10	0.86	+0.21	0.50	-0.11	0.71	+0.16	1.47	+0.61	0.40	-0.75
Havre	1.26	+0.59	0.66	+0.05	0.56	-0.05	0.23	-0.50	0.37		1.00	+0.49	0.85	-0.14
Helena, WBO	1.24	+0.63	0.89	+0.04	0.94	+0.47	0.34	-0.22	0.37	0.00	1.10	+0.31	0.81	-0.31
Livingston	1.98	+0.81	0.42	-0.31	0.74	+0.14	0.14	-0.40	0.41	-0.13	1.62	+0.65	1.56	
Lewistown Arpt.	2.07	+1.71	0.62	+0.41	0.57	+0.37	0.22	-0.51	0.57		1.35	+0.32	1.35	+0.08
Mystic Lake	4.11	+2.27	1.12	-0.46	1.32	+0.28	0.51	-0.63			3.59	+1.54		
Bozeman	2.35	+0.93	0.85	-0.15	0.59	-0.39	0.83	-0.04	0.44	-0.27	3.02	+1.62	1.31	
EASTERN DIVISION														
Billings #2	2.43	+0.98	0.66	-0.10	0.86	+0.22	0.39	-0.24	0.54		0.63	-0.34	1.56	+0.26
Circle	1.35	+0.50			0.28	-0.47	0.30	-.037	0.10	-0.51	0.19	-0.81	1.11	-0.03
Frazer	0.97	+0.09	0.55	+0.02	0.55	+0.16	0.89	+0.48	0.30	-0.04	0.69	-0.01	1.42	+0.46
Malta	0.82	+0.09	0.33	-0.08	0.42	-0.04	0.10	-0.37	0.25	-0.12	0.57	+0.03	1.00	+0.20
Mildred	3.43	+2.69	0.79	+0.42	0.91	+0.59	0.13	-0.21	0.12	-0.14	1.03	+0.61	1.72	+0.65
Medicine Lake	1.02	+0.27	0.24	-0.09	0.35	+0.07	0.16	-0.15	0.02		0.15	-0.26	0.79	-0.10
Miles City	3.20	+2.30	0.41	-0.16	0.52	-0.11	0.34	-0.32	0.19		1.10	+0.24		
Fort Peck	0.47	-0.28	0.46	-0.01	0.38	+0.10	0.11	-0.27	0.11		0.34	-0.16	0.86	-0.22

Montana SNOW SURVEYS May 1,1947

MISSOURI BASIN

WATERSHED and SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	Snow Depth (inches) 1947	SNOW COVER MEASUREMENTS Water Content (inches) Same 1947	Approx. 1946	Date 1945	Past Record Years of Record	Av. Water Content (inches)
Gallatin River												
Devil's Slide	Mont. 1	14	5S	6E	8100	5-3	70.5	28.2	22.3	18.3	13	20.4
Hood Mead. Ext.	" 2	22	4S	6E	6600	5-3	21.2	7.3	1.3	6.0	13	3.5
320 Ranch	"	12	9S	3E	6600	5-1		11.85	9.45	5.02	7	8.15
Madison River												
Hebgen Lake	" 7	22	11S	3E	6550	5-2	3.6	1.6	1.2	2.2	13	2.2
21 Mile	" 6	44.3N		110.7W	7150	5-2	31.8	14.6	10.3	7.3	13	10.0
West Yellowstone	" 8	34	13S	5E	6700	5-2	8.6	3.7	1.8	2.1	13	3.0
Jefferson River												
Gibbons Pass	" 13	4	2S	19W	7100	4-29	56.4	25.4	17.4	17.6	11	18.4

MONTANA SNOW SURVEYS MAY 1, 1947

MISSOURI

DRAINAGE BASIN and SNOW COURSE	LOCATION						SNOW COVER MEASUREMENTS					
							Snow Depth (inches)	Water Content (inches)				Past Record
	No. of State	Sec -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	1947	Same 1947	Approx. 1946	Date 1945	Years of Record	Av. Water Content (inches)
Main Stem												
Above Great Falls												
Chesman	Mont.	18 2	8N	6W	6200	5/2	3.4	1.2	0.0	3.6	11	1.1
Kimini Lower	"	15 13	8N	6W	6250	5/1	6.8	2.1	9.0	5.9	12	1.5
Kimini Middle	"	16 13	8N	6W	6800	5/1	32.2	11.8	1.4	9.6	12	6.1
Kimini Upper	"	17 19	8N	5W	8000	5/1	41.7	14.6	4.6	12.8	12	9.3
Stemple Pass	"	19 16	13N	7W	6900		21.6	7.8	2.0	10.0	13	4.9
Marias River												
Marias Pass	"	21 48.3N		113.4W	5250	5/4	22.4	11.5	8.8	14.3	13	7.2

Montana SNOW SURVEYS May 1,1947

YELLOWSTONE

DRAINAGE BASIN and SNOW COURSE	LOCATION					SNOW COVER MEASUREMENTS						
								Water Content (inches)			Past Record	
	No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	Snow Depth (inches) 1947	Same 1947	Approx. 1946	Date 1945	Years of Record	Av. Water Content (inches)
Main Stem												
Canyon #1	Mont.	2 44.7N		110.5W	7750	5-1	32.6	10.5	---	---	1	---
Canyon #2	"	2 44.7N		110.5W	7750	5-1	38	14.2	---	---	1	---
Lake	"	1 44.6N		110.4W	7850	5-1	27.6	7.1	---	---	1	---
Clarks Fork												
Cooke City	"	10 25	9S	14E	7400	4-30	17.7	4.8	---	---	1	---

Montana SNOW SURVEYS May 1 ,1947

COLUMBIA

DRAINAGE BASIN and SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	Snow Depth (inches) 1947	SNOW COVER MEASUREMENTS Water Content (inches) Same 1947	Approx. 1946	Date 1945	Past Record Years of Record	Av. Water Content (inches)
Bitterroot												
E. Fork Rg. Sta.	Mont. 2	16	2N	17W	5400	4-29	00	00	00	---	9	00
Gibbons Pass	" M-13	4	2S	19W	7100	4-29	56	25.4	17.4	17.6	11	18.4
Nez Perce Pass	Idaho -	32	28N	16E	6575	5-6	13	6.7	4.4	13.1	10	8.4
Skalkaho	Mont. 7	30	6N	17W	7258	4-30	63	30.7	25.9	20.6	11	21.3
Blackfoot R.												
Stemple	" M-19	16	13N	7W	6900	--	21.6	7.8	2.0	10.0	13	4.9
Stuart Mt.	" 9	6	14N	18W	7400	5-1	71	44.6	30.2	31.7	11	26.8
Clark Fork-Above Milltown												
Skalkaho	" 7	30	6N	17W	7258	4-30	63	30.7	25.9	20.6	11	21.3
Stemple	" M-19	16	13N	7W	6900	--	21.6	7.8	2.0	10.0	13	4.9
Storm Lake	" 3	19	4N	13W	7780	5-1	48.0	17.9	10.1	13.1	9	13.0
Clark Fork-Below Milltown												
Baree Mt.	Mont. 30	1	25N	31W	6000	4-30	106	51.8	49.1	35.8	11	35.7
Freezout Mt.	" 12	21	15N	27W	7000	5-2	82	49.6	28.2	29.8	10	27.0
Hoodoo Creek	" 11	9	14N	27W	6200	5-1	108	45.3	47.1	44.8	10	36.1
Lookout	Idaho -	4	47N	6E	5250	4-30	59	27.2	32.8	26.1	11	21.7
Packers Meadow	Idaho -	15	38N	15E	5700	5-1	48	26.1	11.7	20.3	11	11.9

Montana SNOW SURVEYS May 1, 1947

COLUMBIA

DRAINAGE BASIN AND SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	SNOW COVER MEASUREMENTS Snow Depth (inches) 1947	Water Content (inches) Same 1947	Approx. 1946	Date 1945	Past Record Years of Record	Av. Water Content (inches)
Flathead												
Hell Roaring Creek	Mont. 16	7	22N	18W	6750	4-30	69	32.1	30.5	33.7	6	24.8
Desert Mt.	" 18	24	31N	19W	5600	5-1	35	16.0	10.5	14.9	11	8.3
Logan Creek	" 29	34	30N	24W	4300	5-1	2	0.6	1.7	0	10	.4
Marias Pass	"M-21	48.19N		113°21'W	5250	5-4	22.4	11.5	8.8	14.3	13	7.2
Stuart Mt.	" 9	6	14N	18W	7400	5-1	71	44.6	30.2	31.7	11	26.8
Kootenai												
Barcee Mt.	" 30	1	25N	31W	6000	4-30	106	51.8	49.1	35.8	11	35.7

-4-1